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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/664,431	09/19/2003	Hyungsoo Choi	UNIL-23	4506
52450	7590	05/30/2007	EXAMINER	
KRIEG DEVAULT LLP ONE INDIANA SQUARE SUITE 2800 INDIANAPOLIS, IN 46204-2079			STOUFFER, KELLY M	
			ART UNIT	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/664,431

Applicant(s)

CHOI, HYUNGSOO

Examiner

Kelly Stouffer

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 April 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

37 CFR 1.131 Affidavit

1. The affidavit filed on 13 April 2007 under 37 CFR 1.131 has been considered but is ineffective to overcome the Ross et al. reference.

The evidence submitted is insufficient to establish diligence from a date prior to the date of reduction to practice of the Ross et al. reference to either a constructive reduction to practice or an actual reduction to practice (i.e. filing a US Patent application). Where conception occurs prior to the date of the reference, but reduction to practice is afterward, it is not enough to merely allege that the applicant or patent owner had been diligent. See *Ex parte Hunter*, 1889 C.C. 218, 49 O.G. 733 (Comm'r Pat. 1889). Rather, applicants must show evidence of facts establishing diligence.

Though the conception of the invention is established by the declaration in December 2000 and data show the invention in February and March 2001, there is a large amount of time between March 2001 and August 2002 that was accounted for by concluding experimentation and preparing the invention report. There is no evidence supporting this statement, and it is perceived by the examiner that this amount of time lagging between the conception of the invention and the preparation of the invention report shows a lack of diligence. Also, the period of time between September 2002 and February 2003 is similarly not supported by evidence showing diligence and this amount of time shows a lack of diligence in filing the application. In addition, between June 2003 and September 2003, this is perceived by the examiner as an excessive amount

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of time to revise and review an application, and this period of time is also deemed to show a lack of diligence, absent evidence showing otherwise.

The declaration is also defective because it does not state that the acts relied upon to establish diligence took place in the U.S. or a WTO or NAFTA country. See MPEP 715.07 (C).

Response to Arguments

2. Applicant's arguments, filed 13 April 2007, with respect to the specification have been fully considered and are persuasive. The objection of the specification has been withdrawn.

3. Applicant's arguments, filed 13 April 2007, with respect to the 35 USC 112 2nd paragraph rejection of claim 6 have been fully considered and are persuasive. The 35 USC 112 2nd paragraph rejection of claim 6 has been withdrawn.

4. Applicant's arguments filed 13 April 2007 with regard to the prior art rejections of the claims have been fully considered but they are not persuasive. The applicant argues that Ross et al. does not disclose formation of freestanding nanowires. However, as it is defined by the applicants' specification, freestanding is formation without the use of a template or patterning device. Though the applicant alleges that carbon present between the nanostructures in Figure 1 of Ross et al. is a template or patterning device, the examiner disagrees. The carbon in between the nanostructures is merely a

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byproduct of the organometallic precursors used in forming the nanostructure, and their rejection by the nanostructures is actually what causes spacing between the nanostructures. They are not a template or a patterning device that has to be physically or chemically removed, rather, they are a byproduct of the reaction that is removed in the course of nanostructure formation.

Further, the applicant argues that the process of Ross et al. is not the same as that in claim 9 and therefore cannot be used to establish that forming monocrystalline structures. As an example, the applicant relies on dependent claims to show that claim 9 encompasses more than that is in Ross et al. However, as it is claimed in claim 9, Ross et al. does meet the requirements and therefore it is inherent that since it discloses the same process as the applicant, it will receive the same result. Evidence for this conclusion lies in the applicants' claims – the applicant is claiming that the procedure meets this result, and Ross et al. is showing the same procedure. Limitations of the dependant claims of claim 9 are not present in the claim, but in separate claims, so arguing that Ross et al. does not meet the limitations of claim 9 because it does not meet limitations of the dependent claims is moot.

In addition, the applicant argues that Ross et al. does not include the device requirements in claims 10, 22, and 27. Ross et al. does disclose usefulness in circuit repair in column 1 1st paragraph and circuits would certainly reasonably and broadly include integrated circuits. Further, claims 10, 22 and 27 are intended use recitations and a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably

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distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. Because Ross et al. meets the recitation of the invention as it is claimed, then Ross et al. also meets these claims.

The applicant further argues that there is no reasonable expectation of success required to establish obviousness of claim 3. The method of Ross et al. is disclosed to make nanowires (column 1, first paragraph) and the second dimension can be made as long as desired (Figure 1b, Figure 2a, and growth rates in Table 1). It would have been obvious to one of ordinary skill in the art to grow nanowires with a second dimension at least 50 times greater than the first dimension depending on the desired functionality of the nanowires. Therefore, the length of the nanowires is a result effective variable depending upon desired functionality of the nanowires. One of ordinary skill in the art would recognize that modifying reaction conditions with a desired result in mind has a reasonable expectation for success.

Therefore, in view of the foregoing arguments, the prior art rejections of the previous office action are maintained and repeated here.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

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5. Claims 1-2, 5, 6, 8-11, 13-18, 20-22 and 26-27 are rejected under 35 U.S.C. 102(a) as being anticipated by Ross et al. (App. Phys. Lett. 2003 83(6) pp1225-1227).

Regarding claim 1, Ross et al. discloses performing vapor deposition with an organometallic vapor including copper (column 1 lines 1-7) to form a number of nanostructures on a substrate (abstract), the nanostructures each being freestanding during formation (vertically-aligned as in Figure 1b and without the use of a template or patterning device as freestanding is defined by the applicant) and composed of a material including copper (abstract and title). The nanostructures have a dimension of less than 500 nm as shown in Figure 1a and have a second dimension extending to a respective free end of at least ten times the first dimension as shown in Figure 1b.

With regard to claim 2, the method as disclosed by Ross et al. is the same as that claimed and disclosed by the applicant to provide monocrystalline nanostructures, therefore the nanostructures formed as monocrystalline nanostructures is inherent, as this would be a result of performing the method.

Regarding claim 5, the vapor is generated by evaporating a copper-containing precursor (column 1, second paragraph).

Regarding claim 6, the substrate is heated to less than 400 °C during forming (Table 1).

Regarding claim 8, the vapor deposition is of a chemical vapor deposition type (abstract).

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Regarding claim 9, the method of Ross et al. deposits monocrystalline nanowires on the surface as discussed above.

Regarding claim 10, Ross et al. describes the method as useful in circuit repair in column 1, first paragraph.

Regarding claim 11, Ross et al. discloses the nanowires as copper as discussed above.

Regarding claim 13, the substrate is heated to less than 400 °C during forming (Table 1).

Regarding claim 14, the first dimension of the nanowires is less than 50 nm in Figure 1a.

Regarding claim 15, the method is disclosed by Ross as discussed above, and the nanowires are grown noncatalytically (entire document).

Regarding claim 16, the first dimension of the nanowires is less than 50 nm in Figure 1a.

With regard to claim 17, the method as disclosed by Ross et al. is the same as that claimed and disclosed by the applicant to provide monocrystalline nanostructures, therefore the nanostructures formed as monocrystalline nanostructures is inherent, as this would be a result of performing the method.

Regarding claim 18, Ross et al. discloses the nanowires as copper as discussed above.

Regarding claim 20, the substrate is heated to less than 400 °C during forming (Table 1).

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The method of claim 21 is disclosed by Ross et al. as discussed above.

Regarding claim 22, Ross et al. describes the method as useful in circuit repair in column 1, first paragraph.

Regarding claim 26, Ross et al. discloses the nanowires as copper as discussed above.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
 2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.
 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
-
6. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ross et al.

With regard to claim 3, the method of Ross et al. is disclosed to make nanowires (column 1, first paragraph) and the second dimension can be made as long as desired

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(Figure 1b, Figure 2a, and growth rates in Table 1). It would have been obvious to one of ordinary skill in the art to grow nanowires with a second dimension at least 50 times greater than the first dimension depending on the desired functionality of the nanowires.

7. Claims 4, 12, 19, and 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ross et al. in view of Choi (WO 00/08225).

Ross et al. includes the provisions of claims 4, 12, 19, and 23 except for using Cu(ethylacetoacetate)L₂ with L being trialkyl phosphite and the precursor compounds of claim 23. Choi teaches using a Cu(ethylacetoacetate)L₂ with L being trialkyl phosphite compound and the precursor compounds of claim 23 because these precursors have a high thermal stability, volatility, and ability to deposit high quality copper using CVD techniques (abstract).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Ross et al. to include Cu(ethylacetoacetate)L₂ with L being trialkyl phosphite as the copper nanowire precursor and the precursor compounds of claim 23 as taught by Choi in order to use precursors with a high thermal stability, volatility, and ability to deposit high quality copper using CVD techniques.

Regarding claim 24, Ross et al. discloses the chamber pressure to be less than 1 torr in column 1, paragraph 2.

Regarding claim 25, the precursor of Ross et al. is decomposed to release copper in columns 4-5.

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8. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ross et al. in view of US Patent number 5980983 to Gordon.

Ross et al. includes the provisions of claim 7 except providing oxygen with the copper precursor. Gordon teaches providing oxygen with the copper precursor to make copper oxide in examples 1 and 30.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Ross et al. to include oxygen with the copper precursor as taught by Gordon in order to make copper oxide nanostructures.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kelly Stouffer whose telephone number is (571) 272-2668. The examiner can normally be reached on Monday - Thursday 7:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Kelly Stouffer
Examiner
Art Unit 1762

kms



TIMOTHY MEKS
SUPERVISORY PATENT EXAMINER